DETAILED MINERALOGY AND TRACE ELEMENT COMPOSITION OF SILICATE-BEARING IAB IRON METEORITE MASLYANINO.

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Introduction: IAB iron meteorites often contains silicate-bearing clasts, which, based on mineralogy, trace element and oxygen isotope evidences, indicative for close genetic relations with winonaites. Here we report first detailed results on Maslyanino iron meteorite, which was found in 1992 (Novosibirsk region) and preliminary classified to IAB irons based on metal composition.

Methods: Several thin 2-4 cm plates of meteorite from Central Siberian Geological Museum (Novosibirsk) were investigated by scanning electron microscope (Tescan MYRA 3 LMU) with energy-dispersive system X-Max-80 (Oxford Instr.). Trace elements composition was obtained by LA-ICP-MS (Thermo Scientific Element XR) method at Tokyo University (Japan). We used homogenous Campo del Cielo iron and synthetic FeNi-metal [1] as standards. Graphite was characterized by Raman spectrometry using a Horiba Jobin Yvon LabRAM HR8000 microspectrometer with an Nd:Gd 532-nm laser.

Results and discussion: Maslyanino meteorite is a fine-grained octahedrite. Metal part consists of kamacite and taenite forming Widmanstätten patterns and abundant irregular schreibersite grains. The modal ratio of taenite is 25.3(0.5)% . Silicate inclusions have variable form including separate silicate grains in metal matrix. Large troilite aggregates are associated with silicate inclusions and typically form rounded aggregates along boundaries of silicate clasts. Digitized point counting of minerals in the polished plates (total area is ~20 cm²) indicates following modal composition: metal = 54-57%, silicates and phosphates = 20-29%, troilite = 14-21%, graphite = 3-5%, and schreibersite = 1-2%. Similar relationships are preserved in large sample sections of 10-20 cm in size.

Silicate (+phosphate) inclusions contain olivine (Fa44-66), orthopyroxene (En88-94Fs5-7Wo1-2), clinopyroxene (En53, s4Fs3,5Wo45-46), plagioclase (Ab72-84An15-25Or3-5), apatite (F = 2.3(3) wt.%, Cl = 2.8(3) wt.%), merrillite, and chromite (Mg# = 36-40, MnO = 3.7-4.5 wt.%, ZnO = 1.8-2.3 wt.%). Silicate minerals are typical for IAB irons and winonaites [2]. Graphite is abundant inside the silicate inclusions as well as along their boundaries and inside metal, where it forms cliftonite aggregates. Rare daubréeelite and altaite (PbTe) were also observed in silicate inclusions coexisting with troilite. Some olivines contain rounded microinclusions of metal, troilite, daubréeelite and nickelophosphide (52-54 wt.% Ni). Schreibersite in metal matrix contains 34-37 wt.% Ni. Closely related meteorite Woodbine [4]. Two-pyroxene thermometry indicates crystallization temperatures of 982(17) °C using Well’s (1977) and 909(20) °C using Taylor’s (1988) thermometers. These values are relatively low taking into account whole range of temperature estimations for IAB irons (950-1200°C) [5].

Trace elements in silicates revealed that orthopyroxene has LREE depleted chondrite-normalized spectra with minor Eu anomaly. Clinopyroxene has M-shape REE pattern and is depleted by Nb and Sr. Plagioclase has positive Eu anomaly and enriched by LREE and Sr relative to other IAB irons. Apatite and merrillite are strong concentrates of REE and Sr, have pronounced Eu anomaly and depleted by Zr and Nb. Apatite contains 11-16 ppm Th and 4.8-5.3 ppm U.

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